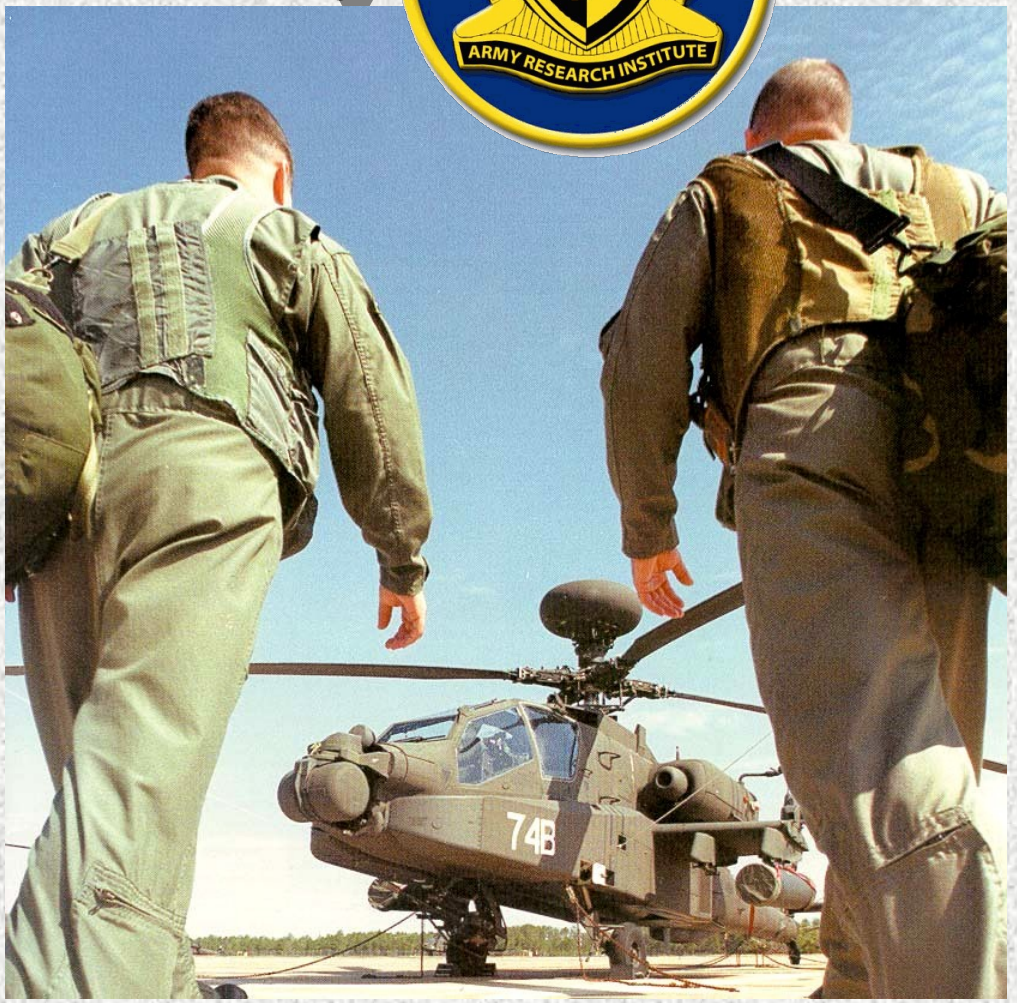
SELECTION INSTRUMENT FOR FLIGHT TRAINING



DoD Human Factors Engineering Technical Advisory Group

Personnel Selection & Classification SubTAG

2 November, 2004

Dr. William R. Howse
Dr. Lawrence C. Katz
ARI Rotary-Wing Aviation Research Unit
Fort Rucker, AL

SIFT: History

SELECTION INSTRUMENT TIMELINE

1941 Air Crew Classification Battery

Army Air Force Qualifying Examination

1955 Army Fixed-Wing Aptitude Battery

Army Rotary-Wing Aptitude Battery

Army Aviation Test Battery

1966 Flight Aptitude Selection Test

1978 Revised Flight Aptitude Selection Test

1979 Aeroscout Algorithm

Proficiency-Based Aviator Selection System

1983 Multi-Track Assignment Battery

1987 Alternate Flight Aptitude Selection Test

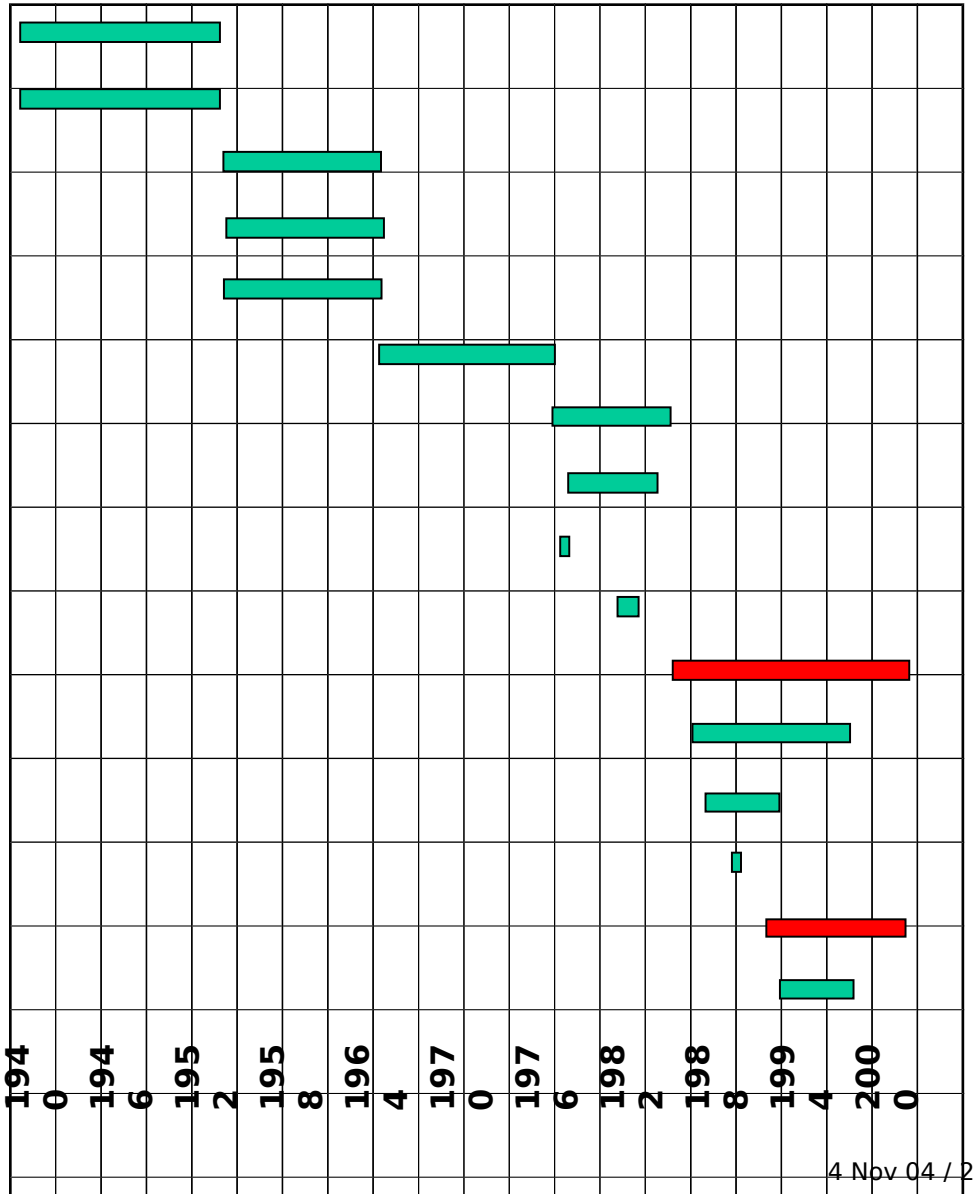
1988 Multi-Track Test Battery

1989 Multi-Track Assignment Algorithm

1991 New Flight Aptitude Selection Test

1993 Automated Form 6256

1994 Dual-Track Assignment Algorithm



SIFT: History

AVIATOR SELECTION EFFORTS

FAST

FLIGHT APTITUDE SELECTION TEST

CONTRACT + IN-HOUSE FUNDING

IMPLEMENTED 1966

RFAST

REVISED FLIGHT APTITUDE SELECTION TEST

CONTRACT + IN-HOUSE FUNDING

IMPLEMENTED 1978

PASS

PROFICIENCY-BASED AVIATOR SELECTION SYSTEM

CONTRACT + IN-HOUSE FUNDING

PROOF OF CONCEPT 1979

AFAST

ALTERNATE FLIGHT APTITUDE SELECTION TEST

CONTRACT + IN-HOUSE FUNDING

IMPLEMENTED 1987

AUTO 6256 RELEASED 1993

NFAST

NEW FLIGHT APTITUDE SELECTION TEST

CONTRACT + IN-HOUSE FUNDING

CONSTRUCTED 1990

AFAST CRITERION ASSESSMENT

K.D. CROSS - RN 97-22

CONTRACT FUNDING

COMPLETED 1997

SIFT: History

AVIATOR CLASSIFICATION EFFORTS

AEROSCOUT ALGORITHM

IN-HOUSE FUNDING

IMPLEMENTED 1979

MTAB

MULTI-TRACK ASSIGNMENT BATTERY

CONTRACT FUNDING

PROOF OF CONCEPT 1983

MTTB

MULTI-TRACK TEST BATTERY

IN-HOUSE FUNDING

IMPLEMENTED 1988

MTAA

MULTI-TRACK ASSIGNMENT ALGORITHM

IN-HOUSE FUNDING

IMPLEMENTED 1989

ISSCAC

INTEGRATED SYSTEM FOR SELECTION OF AVIATORS

PROJECT INITIATED 1993, CANCELLED 1995

DTAA

DUAL-TRACK ASSIGNMENT ALGORITHM

IN-HOUSE FUNDING

IMPLEMENTED 1994

SIFT: Background
AFAST CONFIGURATION

- **Paper and pencil test**
  - Implemented 1987
  - Administered by Army Personnel Testing (HRC)
  - Screening instrument
  - Also used for related enlisted MOS
  - 200 items in 7 subtests
    1. Background Information
    2. Instrument Comprehension
    3. Complex Movements
    4. Helicopter Knowledge
    5. Cyclic Orientation
    6. Mechanical Functions
    7. Self Description
  - Total test time 2 hrs
  - Administered by TCOs at 490 locations worldwide

SIFT: Background

AFAST DEFICIENCIES

1. Minimal predictive validity

- R=.43 FAST, 1966
- R=.31 AFAST, 1988
- R=.17 AFAST, 1993
- Not assessable today
  - Expected current validity <.15

2. Multiple compromises

- Most recent:
  - Form A, missing tests, 1999
  - Form B, missing tests, 2001

3. Limitations in paper & pencil instruments

- Critical attributes not measurable
  - Time sharing
  - Perceptual-motor skills
  - Perception speed
- High frequency of scoring errors

4. Sub-optimal selection strategy

- *Select-out* best when selection ratio is high
  - AFAST predicts failure in IERW
- *Select-in* best when selection ratio is low
- *Sequential* strategies superior to either

5. Incorrect attribute set

- Changes in Army Aviation missions +
- Changes in aircraft and mission equipment **produce…**
- Shift from motor skills to cognitive abilities

6. Insufficient operational support

- No data archive support
- No active performance evaluation
- Minimal admin support
- No replacement ready

SIFT: Background

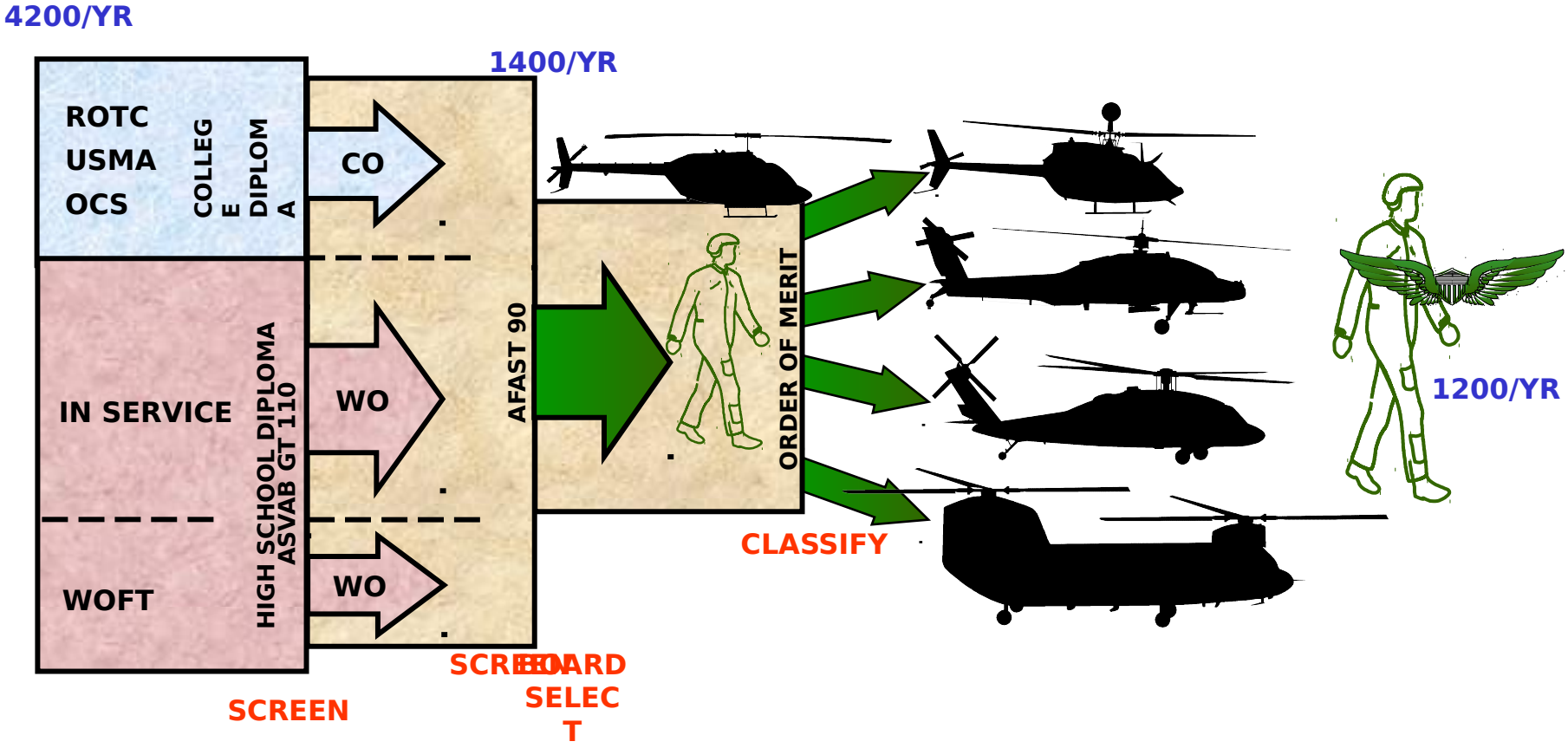
OPERATIONAL NEEDS STATEMENT

Produced by the *Aviation Personnel Proponency Office*, Ft. Rucker, June 2003

1. Selection Instrument
   - Correct the identified deficiencies
     - Computer-based, web-administered
   - Life Cycle management
     - Rapid test performance assessment
     - Rapid revision capability
   - Future Force Aviator in Future Combat Systems
2. Classification Instrument & Algorithm
   - FS XXI POI
3. Extended selection applications
   - UAV operators
   - Special Operations aviator "direct assessment"
4. Initial Operational Capability
   - Hardware & training to all test sites
5. Operation & Maintenance
   - Data archive

SIFT: Background

ARMY AVIATOR ACCESSION PROCESS



SIFT
COLLABORATION

U.S. Army Aviation Center

Human Resources Command

Air Force Research Laboratory

Naval Operational Medicine Institute

SIFT: Contract Effort

COMPLETRS

CONTRACT FOR MANPOWER, PERSONNEL, LEADER DEVELOPMENT AND TRAINING RESEARCH STUDIES

Contract # DASW01-03-D-0016 Delivery Order 008

Personnel Decisions Research Institutes, Inc.

INNOVATIVE SOLUTIONS FOR A CHANGING WORLD

AMERICAN INSTITUTES FOR RESEARCH

DAS

Damos Aviation Services

SIFT: Contract Effort

TEAM (19 Members)

COTR	Bill Howse & Larry Katz, ARI-RWARU
Principal Investigator	Wally Borman, PDRI
Co-Project Directors	Ken Bruskiewicz, PDRI Janis Houston, PDRI
Task Leaders	Cheryl Paullin, PDRI (predictors) Chris Kubisiak, PDRI (job analysis) Ken Bruskiewicz, PDRI (criterion measures) Larry Albright, AIR (computerization)
Technical Advisors	Diane Damos, Bruce Gould, & Malcolm Ree, Damos Aviation Services Scott Oppler, AIR
Other Key Players	Dave Dorsey & Chuck Keil, PDRI Dwayne Norris & David Baker, AIR

SIFT: Contract Effort

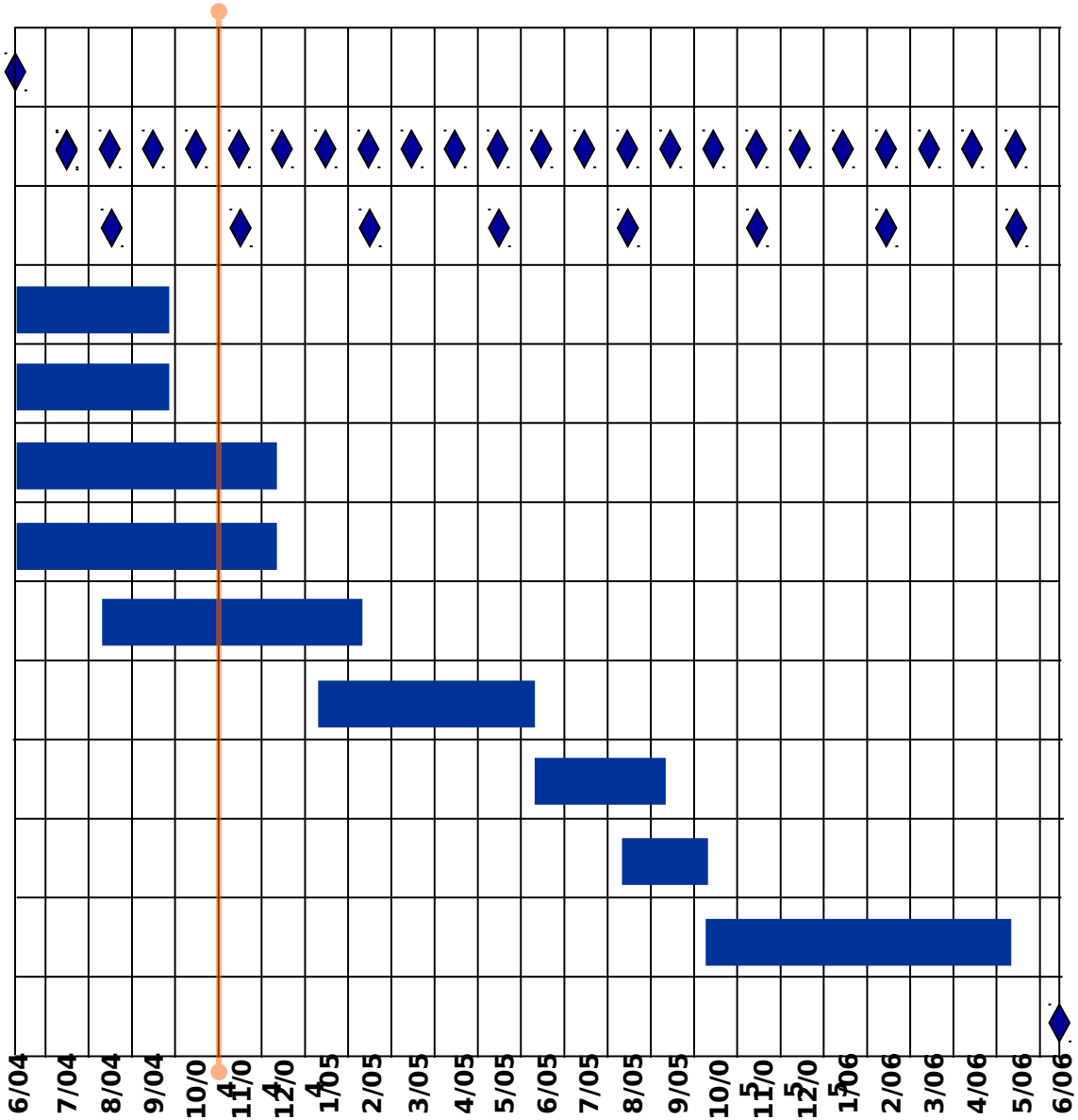
TASKS

1. Review existing accession process and relevant literature
2. Conduct training and job analysis
3. Develop criterion and predictor measures
4. Construct and pilot-test the prototype instrument
5. Validate and assess utility and efficiency
6. Produce comprehensive technical report

SIFT: Contract Effort

SCHEDULE

1. Initial Project Planning / Review Tech Approach
2. Monthly letter progress reports
3. In-Progress Reviews
4. Draft compendium of personal attributes
5. Selection and test strategies
6. Job analyses
7. Final compendium of personal attributes
8. Criterion and predictor measures
9. Prototype selection instrument
10. Pilot test results
11. Revised selection instrument
12. Validation results
13. Final report



SIFT: Contract Effort

OBJECTIVES

- Computer-based & web administered selection instrument for Army aviation
  - -Future Force aviator
  - -Future Combat Systems
- Rapid assessment of validity
- Rapid revision
- Improved security
- Adaptable to other occupational categories
- Adapt existing instruments

Specific Objectives

- Prototype, multidimensional battery that measures abilities/traits important for pilot performance
- Adapt existing instruments
- Adaptable to other occupations
- Consider, to the extent possible, Future Force aviators and future combat systems
- Capability for secure delivery over wide area network at widely distributed locations
- Capability for rapid assessment of validity
- Capability for rapid revision
- Integrate developments with USN & USAF
- Testing time should be reasonable

Literature Review

- Searched:
  - Contractor team archives
  - ARI-RWARU archives
  - computerized databases
    - ✓NTIS, DTIC, etc
- Assembled:
  - materials from military and other aviation-related sources
    - ✓ARI-RWARU archives
    - ✓briefing slides from Tri-Services Conference
- Reviewed:
  - => 100 documents
- Created:
  - spreadsheet
    - ✓ structured summary
    - ✓ validity evidence, key references, etc

Literature Review: General Findings

- Validity isn't a highly differentiating factor
  - Reasonable validity levels observed
    - Military & Civilian batteries
- Much less effort and success in predicting pilot performance beyond training
- Pilot selection batteries have been computerized
  - e.g., MTTB, ASTB, BAT
  - Programmed in out-of-date languages
- Navy APEX only known online test

Attribute Domains

- **Cognitive Ability**
  - Most batteries measure specific cognitive abilities
    - General intelligence (“g”) typically accounts for most test score variance
  - Different approaches lead to different types of tests:
    - Individual differences -- spatial orientation, numerical reasoning, word knowledge
    - Information processing -- time-sharing, working memory, dichotic listening, choice reaction time
    - Performance-based -- multiple-task performance, simulations
  - Most cognitive abilities measurable using a PC
    - May require non-standard components or peripherals
    - e.g., timing circuit board, headphones

Attribute Domains

- Psychomotor Skills
  - Tracking
  - Complex coordination
- Sensory/Perceptual abilities
  - Visual/Auditory processing times
  - Pattern recognition
- Multi-tasking
- Aviation/Helicopter Knowledge
- Motivation
- Personality Characteristics (Normal)
- Mental Stability
  - May incur ADA limitations
- Stress tolerance/coping

Attribute Domains

- **Personality**
  - Many attempts - little success
    - Inappropriate trait selection
    - Unrelated criterion measures
      - e.g., training grades
  - Construct-oriented approach
    - Relevant traits
    - Rational item-writing and scoring
    - Use pilot test data to clean up the scales
  - Candidate target constructs
    - Conscientiousness
    - Stress Tolerance
    - Adaptability
    - Risk Taking

Job Analysis

- Purpose
  - Documentation of pilot job
  - Identify KSAs for predictor measures
  - Starting point for criterion development
- Sources of information
  - Literature and existing materials
  - Job observation
  - Subject Matter Expert input

Job Analysis

- Integrate into task and KSA lists
  - POI
  - Training Manuals
  - Performance Evaluation Samples, etc
- Subject Matter Expert review of draft task and KSA lists
- Focus groups
- Finalize task list and KSAs
- JAQ administration & analysis